

whole organism is only subsidiary when the relation of leaves to the rest of the plant is considered.

The chapters on the general processes of horticulture; the correlation of stems and roots, and their separate treatment; the principles of manuring; the theories of the proper supply of water to the plant, the aëration of its roots, &c., will be read with much attention, and will be found very useful in actual practice. The deposition of nutritive material in various parts of the plant, and the ways in which this can be influenced by different modes of treatment of the shoot at different ages, deserve careful study. The relation of such questions to the operations of pruning, grafting, &c., is discussed at some length, and the development of vegetative or fruiting branches respectively, is shown to be capable of great modification in the hands of the skilled horticulturist.

The book, however, though a valuable one for practical gardeners, leaves something to be desired as a contribution to the literature of vegetable physiology. Indeed some of the fundamental facts of the metabolism of the cell are, if not inaccurately, at any rate not clearly stated. The absorption of water is certainly one of the most important processes which it carries out. As described on p. 127, the early changes in the young cell connected with this process are stated as follows:—

“Very soon there arise within the protoplasmic mass which fills up the cells, very small quantities of liquid substance (cell sap) which collect together to form small vesicles (vacuoles), and these give to the protoplasm a foam-like structure. Now, as the protoplasm becomes used up during the elongation of the cells, the vacuoles increase in number, run together, and force the remainder of the protoplasm outwards towards the cell wall.”

Put in this way, the student would get the idea that the elongation of the cells takes place apart from the entry of water, and that the formation of the vacuole, that is, the increase of the cell-sap, is rather the result than the cause of the extension of the cell. No statement is made as to the cause of the entry of the water, the osmotic activity of the cell-contents, which really underlies all cell-growth.

Another strange statement is that the main cause of the growth in length of a young stem is the longitudinal tension in the pith, which “drags the young ring of wood with it, as long as the latter is still soft and thin-walled.” This will be a new view to most physiologists.

Dealing with the absorption of nitrogen by certain leguminous plants, and the recently established fact that the atmosphere is a source of supply of this constituent, the author commits himself to the view that this absorption is carried out by means of their leaves.

In section 23, which treats of the substances formed by the leaves, we find several statements to which exception must be taken. The classification of the vegetable proteids is inaccurate, the latter being said to consist of albumins, caseins, and fibrins. Albumins are extremely rare in plants, and fibrin resembling animal fibrin is unknown. Globulins, which are numerous and varied, and albumoses, which have comparatively recently been investigated, are not even mentioned. The formation of starch grains in the leaves is thus described—

“When the light shines on the leaf its transpiration is exactly increased, and its cells lose some of their water;

then we may imagine the starchy substance to be forced out of the thickened (concentrated) cell-sap, and the latter will become more liquid.”

The nutrition of the cell is summed up in the remarkable sentence:

“The nutrition consists in this, that the raw materials which enter the cell are attracted, now by one, now by another of the constituents of the cell, and adopt its specific movements, and are thus transformed with the same substance (assimilated).”

These drawbacks to an otherwise valuable work make one regret that Prof. Weiss has confined himself to translating Dr. Sorauer's text. Had he rather edited than translated it, no doubt we should have found the English edition free from these defects.

MINES AND MINERALS.

Traité des Gîtes Minéraux et Métallifères. Cours de Géologie appliquée de l'École Supérieure des Mines.

By E. Fuchs and L. de Launay. (Paris: Baudry, 1893.)

Étude industrielle des Gîtes Métallifères. By George Moreau. (Paris: Baudry, 1894.)

IN these days, when memoirs and papers follow in rapid succession, the geologist and the miner are justly grateful to any careful compiler who will aid them to keep pace with the ever-widening flood of technical literature. The debt of gratitude is increased when the task is undertaken by a writer like Prof. de Launay, who brings together into one colossal work the results of the labours of his master, the late Prof. Fuchs, and of his own personal researches.

The book is a treatise upon applied geology, which Fuchs defined as the application of geological knowledge to seeking and working mineral deposits. Very rightly Fuchs took a wider basis for his course of lectures at the Paris School of Mines than mere ore deposits. He recognised the fact that the mining engineer of to-day must be a man of wide attainments, capable of giving an opinion upon all sorts of mineral workings, reporting upon gold mines in one journey, upon gem-diggings in the next, and a little later being asked to determine the value of deposits of phosphate of lime or other earthy minerals. For work of this description Prof. Fuchs' lectures formed an admirable kind of training, which has too often been neglected in the past; in fact, until this treatise appeared, many geologists may have failed to realise the vast importance of the subject.

While admitting that various systems of classification may be adopted, Prof. de Launay says that he felt bound to arrange his minerals according to the metalloid or the metal, and he chooses the so-called chemical order. In a huge book of this description, alphabetical order would have been more convenient, and would have prevented some of the anomalies which cannot help striking the reader. The chloride, carbonate, and sulphate of sodium appear under the head of that metal, whilst the borate and nitrate are classed respectively under boron and nitrogen; again, chalk and gypsum are brought under calcium, whilst apatite is placed under phosphorus, no doubt for the reason that the non-metallic element is the

one to which the mineral more especially owes its commercial importance. While slate is sandwiched in between the gems, under the heading "Silica and Silicates," clay is relegated to "Aluminium."

In a general treatise upon mineral deposits, exception may fairly be taken to the absence of any mention of coal; the author excuses himself on the ground that fuel forms a special subject too vast to be included within the compass of his book. The overwhelming importance of coal seems, on the other hand, an additional reason for finding it a place in a work which is practically an encyclopædia of applied geology; besides, if fuel is to be omitted, why are natural gas and petroleum inserted?

In a gigantic work of this description, it is impossible for an author to avoid some errors. Five mistakes in spelling Welsh words in the first three lines of p. lxxviii. will not be looked upon as a heinous crime by the average Englishman, who himself feels that he is skating upon thin ice when he is dealing with the orthography of names of places in the Principality; however, these are not the only cases of misprints which might be noticed.

The geographical tables, occupying forty-five pages, form a useful feature in the book; an alphabetical list is given of the principal minerals worked in each country, together with references to the pages where they are described. These tables and the index of localities take the place of a general index, which is not supplied. Small maps inserted in the text are of much assistance in enabling the reader to follow the author's descriptions; the total number of woodcuts, 390, may seem large, but, scattered as they are through more than 1800 pages, they are not as numerous as one would like. Great pains have been taken with the bibliography, and Prof. de Launay's lists will often bring into notice original papers which would otherwise have passed unnoticed.

Though too expensive for the pockets of ordinary students, the book will find a place in the libraries of all mining schools and geological and engineering societies, and it is sure to be frequently consulted with profit by geologists and mining engineers.

Moreau's work has a totally different object to that of de Launay; the latter is a record of observed facts, whilst the former, dealing solely with metallic ores, is mainly devoted to general principles. After describing briefly the classifications of ore deposits proposed by von Groddeck, de Lapparent, Phillips, Whitney and Raymond, the author suggests one of his own, viz. :—

- (A) Stratified deposits.
- (B) Eruptive deposits.
- (C) Deposits in pre-existing cavities.
- (D) Substitution deposits.

Mineral veins are classed under the head (C), and apparently Moreau does not admit that they may sometimes be substitution deposits.

Two chapters are devoted to disquisitions upon the origin of mineral veins, and are based upon the works of Daubrée, Lyell, Elie de Beaumont, De la Beche, Henwood, Moissenet, Geikie, and others; Vogt's recent researches and theories remain unnoticed.

Chapter v., which treats of the chemical and physical characteristics of ores, and the earthy minerals which accompany them, should have been omitted; and the same remark applies to the chapters upon qualitative testing, quantitative assaying, dressing and smelting. These subjects cannot be taught in a few pages, and are better studied in the ordinary text-books.

Chapter vi., largely borrowed from von Groddeck, Phillips, Fuchs and de Launay, contains descriptions of well-known characteristic ore deposits. The important iron ores of the Secondary rocks are dismissed in a very cavalier fashion, for, strange to say, no mention is made of the great iron-field of the Department of Meurthe and Moselle, Lorraine and Luxemburg.

The most valuable part of the book for mining men will be found in two of the concluding chapters, which deal with the study of ore deposits from a purely commercial point of view. They are full of useful hints and warnings, not only to the engineer who is examining mining properties offered for sale, but also to the capitalist who is meditating their purchase. M. Moreau is evidently imbued with many of the ideas which were running through the brain of Mr. J. H. Collins when he delivered his recent presidential address to the Institute of Mining and Metallurgy. The more deeply counsel of this kind is taken to heart, the better will it be for investors in mining enterprises.

A few errors in the names of well-known geologists are inexcusable. It is strange that any one should write "Sir Richard Lyell"; "Sir Logan Foster, Whitney," is evidently meant for "Sir William Logan, Foster and Whitney"; even Elie de Beaumont's name is not always spelled correctly. "Gossan" is a Cornish and not a Welsh term, as supposed by the author.

OUR BOOK SHELF.

Elementary Text-book of Metallurgy. By A. Humboldt Sexton, F.I.C., &c. (London: Griffin and Co., 1895.)

THIS book is intended, for those who are commencing the study of metallurgy, as a kind of preparatory course to that of Prof. Roberts-Austen, as given in his "Introduction to the Study of Metallurgy," which the student is advised to read after digesting the contents of Prof. Sexton's manual. The work is got up in good style by the publishers, and printed in a clear and distinct manner. With the general arrangement there is very little to complain of; but the same by no means can be said of the subject-matter, which contains many errors, and the definitions are often expressed in such crude language that a student might be easily misled in taking his first lessons in metallurgy from its pages. The following examples may be cited:—P. 3: Malleability. This is the property of being expanded into sheets. Ductility: This is the property of being drawn into wire. A small quantity of antimony in lead is said to make it quite brittle. P. 4: Lead may be drawn into wire if means be taken to prevent the metal being subject to stress. P. 5: With regard to tensile testing, the author says that elongation takes place mostly near the point of fracture. P. 46: There are but two neutral substances in general use, graphite and chrome iron ore. P. 89: Fluor spar is said to be used to increase the quantity of slag. On pp. 92 and 121: C below .5 is termed wrought iron, and steel when C is between .5 and 1.5; while on